A NEW METHOD OF DOING JOBERT'S OPERATION.

By FRED B. ROBINSON, M.D.,

TOLEDO, OHIO.

PROFESSOR ANATOMY AND SURGERY IN TOLEDO MEDICAL COLLEGE.

OUR technique and diagnosis in surgical diseases of the intestines is yet in its imperfect infancy. I would simply ask that the effort to improve this field be received with patience, for the significance of the intestines in abdominal surgery is important, when we consider that a little over 1% of all laparotomies die from intestinal obstruction, due to the operation. I was really gratified at the warm reception with which so many able surgeons received my effort to extend the utility of intestinal surgery, by the introduction of the rawhide or segmented rubber plate. Surgeons welcomed the plates because they were cheap and accessible, and they predicted their usefulness in intestinal anastomoses from the simple fact that the plates had stood the test of dozens of successful living experiments. I hope the plates will serve as a base for further progress, for they possess the utility of being pressed into man's service at any moment. This will increase the opportunity of their use. In the present modification of Jobert's operation it is with the hope of improving the safety of the operation. The danger of Jobert's operation proved very great in our experiments, and of course the main danger lies in the occurrence of fæcal fistula at the points of the invagination sutures. The modifications or improvements I have to offer on Jobert's operation are: First, the avoidance of the invagination sutures, and second, the use of a rubber tube to keep the bowel from invagination at the seat of operation; and third, to keep the lumen of the bowel patent at the same point. I shall only speak from actual facts in the experiments. The invagination in Jobert's operation produced fæcal fistula (with both catgut and linen sutures), and also caused death. The idea that invagination of the intestine will continue to a point of obstruction, from simply turning in a small part of its end, to do the operation, I never saw recorded, but it will actually happen, and it killed several of our dogs. Hence to avoid this disaster, an operation should only turn in about one-half to three-fourths of an inch of the end of the gut. The muscles from that short bit of gut can not get purchase power to progress. In closing a gut end, only one-half an inch should be turned in, and then sutured with a few continuous Lembert sutures. The addition of a rubber tube, I think, increases the safety of the operation very much.

The rubber tube certainly aids in preventing subsequent invagination at the seat of the operation, and the longest part of the tube should be above (three-fourths) the point of operation. The tube keeps the gut lumen patent. It holds the two serous surfaces, which are to unite, in constant approximation. It prevents the gut from wrinkling and allowing fæcal extravasation. It produces the great essential of healing, which is mechanical and physiological rest, which, alone, induces appropriate cell proliferation. The tube is held in its position by one or two sutures passed through the edge of the proximal intestinal end and through the tube. One can determine how long the tube will remain in position by the amount of intestinal wall, the suture, which holds the tube, embraces; or on the kind of suture (catgut or silk or linen).

The main steps of the operation are the severing of the gut and the determination of the proximal and distal bowel, or the direction of the fæcal current. The serous surface of the distal gut is scarified for one-half inch and invaginated to the same extent. Now, a rubber tube which snugly fits the gut lumen is pushed up into the proximal gut and stitched there. (I generally used a tube five inches long, placing about three inches above and two inches below the point of operation.) An inch of the serous surface of the end of the proximal gut is scarified. Then the proximal gut is inserted into the invaginated distal bowel for one inch. , A circular row of Lembert sutures are applied at the junction of the serous surface of the proximal and distal bowel. This same surface for one-half inch adjacent to the sutures is well scarified, and an omental graft wrapped around and sutured in position. The omentum is carefully respread over the intestines, and the belly closed.

The following experiments will explain themselves:

EXPERIMENT NO. 149.—Dog, female, weight, 25 lbs. Abdomen shaved and opened by 3 inch incision (animal chloroformed). The first point was to find the cæcum, which served as a standard to determine the direction of the gut (or fæcal current). The ileum was completely severed. An inch of the serous surface of the distal bowel end was scarified and invaginated for one inch, and rubber tube (¼ inch by 2½ long) was stitched into the proximal gut. An inch of the serous surface of the proximal gut end was scarified. The proximal bowel was inserted into the distal and at the junction of the serous surfaces of the proximal and distal guts 10 circular Lembert sutures were applied. The surfaces of the bowel adjacent to the sutures was well scarified and an omental graft applied and held in position by sutures. Abdomen closed.

The dog died thirty-six hours after the operation. The autopsy showed that the distal bowel had continued to invaginate until it had passed beyond the rubber tube. Death in such cases generally arrives from shock and gangrene. The rubber tube was not long enough to prevent invagination.

EXPERIMENT NO. 152.—Dog, male, weight 15 lbs. Animal chloroformed, belly shaved and opened by median incision of 3 inches. The cæcum was found and the gut's direction determined. The bowel was entirely severed. The distal gut was scarified for ¾ inch and invaginated for that distance. A rubber tube 5 inches long, ¼ inch in diameter was sutured into the proximal gut end so that 3½ inches would project on the proximal side of the operation. An inch of the serous surface of the proximal bowel end was scarified and the proximal bowel end was inserted into the distal. Circular suturing by Lembert's method was done at the junction of the serous surface of the proximal and distal bowels. The serous surface for ½ inch adjacent to Lembert's sutures was scarified and an omental graft applied around the operated parts and held in position by sutures.

The dog made an excellent recovery. He ate, drank and played. He was killed twenty days after the operation. The autopsy demonstrated that the abdominal viscera were quite healthy with a few local adhesions from the operation. The graft had grown firm and solid. A few Lembert sutures still remained. The dog was fattening. The rubber tube had disappeared. The gut lumen had narrowed probably one-fifth of its original size.

Other work was done, but probably sufficient has been given to illustrate the method and technique of the operation. With a dog having a small gut it is difficult and dangerous to do this operation, as gangrene may follow (say of a dog under 12 pounds). But with a good sized gut it seems to me that this ought to be as safe as any intestinal operation of its kind. It should be much safer than Jobert's. The avoidance of the invagination sutures is a great step in advance. The addition of the rubber tube and scarification, with an omental graft, add infinitely to the chance of recovery. Of course, Jobert's operation, and this modification of it, is only to get something better than the dangerous circular enterorrhaphy. Circular enterorrhaphy was found, in the experiments, to show very clearly the following dangers, which I have previously noted, but repeat them, in order that attention may be directed more to them:

1. Circular enterorrhaphy paralyzes the gut at the seat of operation, and hence does not so readily relieve the fæcal obstruction, which is the immediate object of surgical interference.
2. Fæcal fistula is apt to arise at the point of operation.
3. Gangrene or sloughing may arise from the pressure on the tissue of numerous sutures.
4. The lumen of each gut may not be of the same size, and thus present difficulty in union.
5. The pathological changes in the bowel, due to obstruction, offer impediments. The gut may be stretched so thin that a needle can not be passed between the muscular layer and mucous layer without danger of penetrating the mucous membrane and causing fæcal fistula. Also the stretching of the bowel may seriously impair the power of healing. The trauma has destroyed the vascular and nervous integrity of the tissues of the gut wall.

6. Circular stricture may and did follow the operations. Some of the strictures were so severe that both fæces and gas were actually obstructed, and many autopsies showed dangerous narrowing of the gut lumen. Mechanical or even physiological obstruction was liable to occur at almost any moment in such narrowed bowels.

7. The long time required to do a circular enterorrhaphy militates against the chances of recovery. Of all surgery in the world, intestinal surgery should be rapid and skilful. At first it required us to work about an hour to do a circular enterorrhaphy. Acquired dexterity reduced the time to 40 or 30 minutes. We used in a large dog, 25 to 35 interrupted Czerny-Lembert sutures at first. Afterward we made Czerny's suture a continuous suture, which can be done in a couple of minutes. Finally we tried making Lembert's sutures continuous for two, three or four stitches. This worked well and saved time. So that three to five interruptions of Lembert sutures completed the circle around the gut. In this way a circular enterorrhaphy could be completed in less than half an hour. I emphatically oppose doing a circular enterorrhaphy with a continuous Lembert's suture. This was carefully tried, and the worst strictures of all resulted, and not only that, but the thread gradually fell into the gut lumen, and its end dangled for days and even weeks there before it became entirely set free. This long thread will certainly be a dangerous source of infection, as part remains in the gut lumen and part in the gut wall. Infective fluids can go along the thread by mere capillary attraction, not to speak of the wider fæcal fistula it may create.

It should be well borne in mind that about 40 minutes' exposure of the viscera of *some* dogs seemed sufficient to kill them.

Some miscellaneous remarks may suggest useful things. The rubber tube should be made of soft thin walls, and the operator should be positive that it does not press too hard against the gut wall, or gangrene will result. The omentum should be re-spread over the intestines *always*. The operated point should be anchored to the abdominal wall by a thread. The thread should be passed through a small hole in the omentum and protrude at the abdominal incision. This anchoring will enable one to reopen the abdomen and easily find the old operated parts. It will enable one frequently to reopen without going into the general peritoneal cavity, as adhesions have circumscribed the operated part and excluded it from the general peritoneal cavity. Hence it can be washed out with no disturbance of the general abdominal cavity. The direction of the gut must be determined with certainty, then a red ribbon can be tied around the proximal, and another colored around the distal gut, and the whole intestines, except that part operated on, can be replaced in the abdomen.

The omental graft may be applied from the edge of the omentum without severing it. But it is likely to produce less subsequent evil results if *torn* (not cut) from the edges of the omentum. This will allow an uninterrupted re-spreading of the omentum, just before closing the abdomen. Anchorage insures more safety in case of fæcal fistula, as then the fistula will be directed toward the surface in more manageable regions. Catgut proved in experiments of intestinal work *dangerous*. I used almost entirely linen thread, soaked in alcohol. The threads were (*a*) in the great majority of cases thrown into the gut lumen, (*b*) encapsulated and (*c*) absorbed. Threads would occasionally be found partly in the gut lumen and partly in the gut wall *two months* after the operation. The mesentery of the invaginated gut or distal gut should be cut fairly close to the gut wall, as far as it is invaginated. It should not be torn off, as no blood vessels will then be left to nourish it, and gangrene may result. The mesentery of the proximal gut should be cut away as far as it is to be inserted into the distal gut. Both stumps of the mesentery should be scarified with the needle point, as the scarified surface does not bleed so readily, and heals quicker than a clean cut surface. I feel quite certain that hæmorrhagic layers of blood did prevent early healing in some cases. Again, peritoneal plastic exudates are entirely uncertain as to time. The exudate may appear in a few hours, or be delayed some 24 hours. Therefore, the value of the rubber tube is very apparent; it insures continuous coaptation. The approximation of the two bowel surfaces to be healed is constant until exudation has had sufficient time to appear and cement the surfaces.

The necessary mechanical and physiological rest required for definite healing and cell proliferation must be forced by fixation on a bowel which takes the liberty at any moment to caper through a peristalsis and break up any new adhesions. The long rubber tube does this excellently.

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